F2P FY03 Kickoff Meeting

Structural Weapons Effect/ Munitions Effects API

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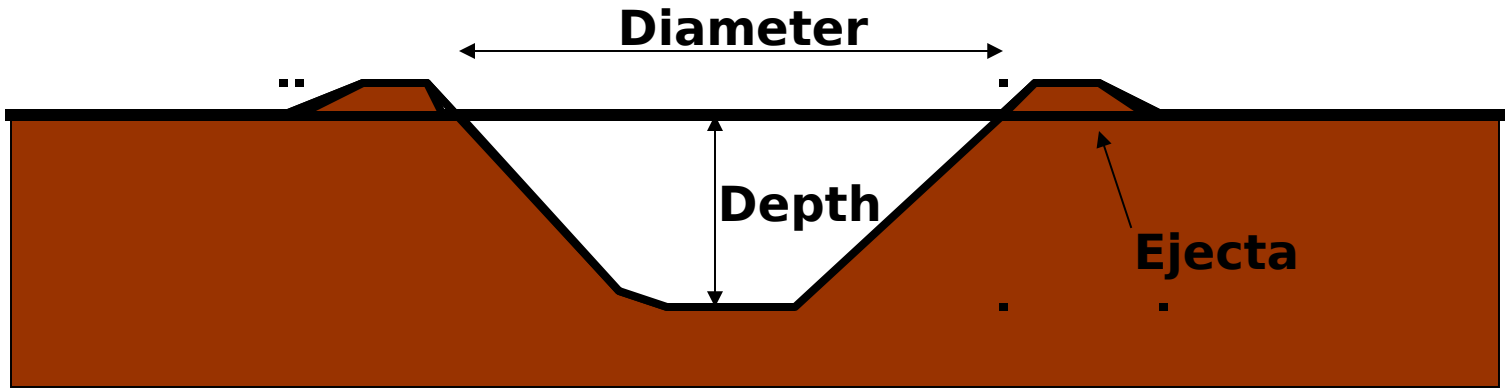
F2P FY03 Tasks - Structural Weapons Effects

- Develop algorithms for predicting cratering and generating a crater field — **2Q**
- Develop algorithms for structural damage from indirect/direct fire munitions — **3Q**
- Baseline development of algorithms to handle cumulative structural damage effects on debris field algorithms — **4Q**
- Develop algorithms for handling overlap of debris and crater fields — **4Q**
- Incorporate new development into Structural Weapons Effects API

F2P FY03 Tasks - Structural Weapons Effects

Task 1: Develop algorithms for predicting cratering and generating a crater fie

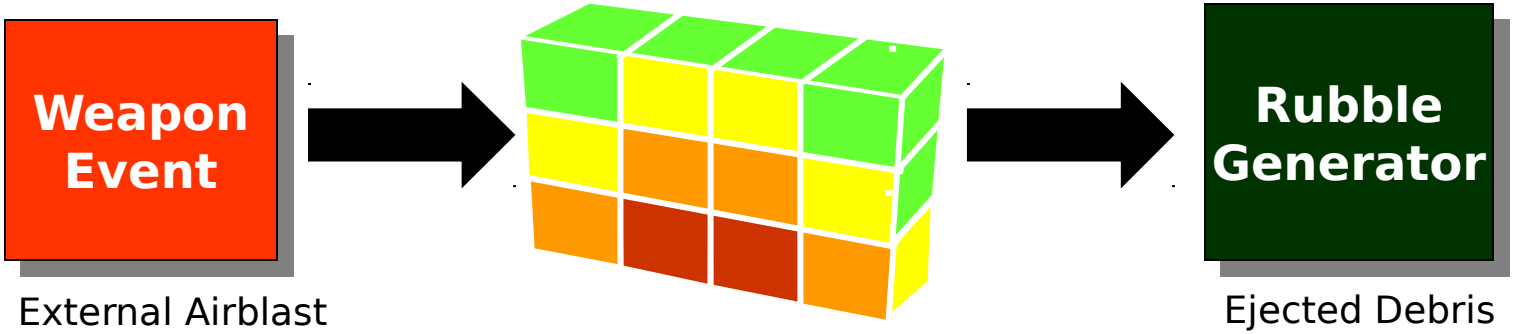
- Predict cratering as a function of weapon, depth of burial, soil/surface type
- Output: crater objects having location and dimensions



F2P FY03 Tasks - Structural Weapons Effects

Task 2: Develop algorithms for structural damage from indirect/direct fire munitions

- Predict dynamic damage as a function of weapon event, structure type, component type, etc.
- Output: building objects having specific 3d damage to feed to rubble generation algorithms



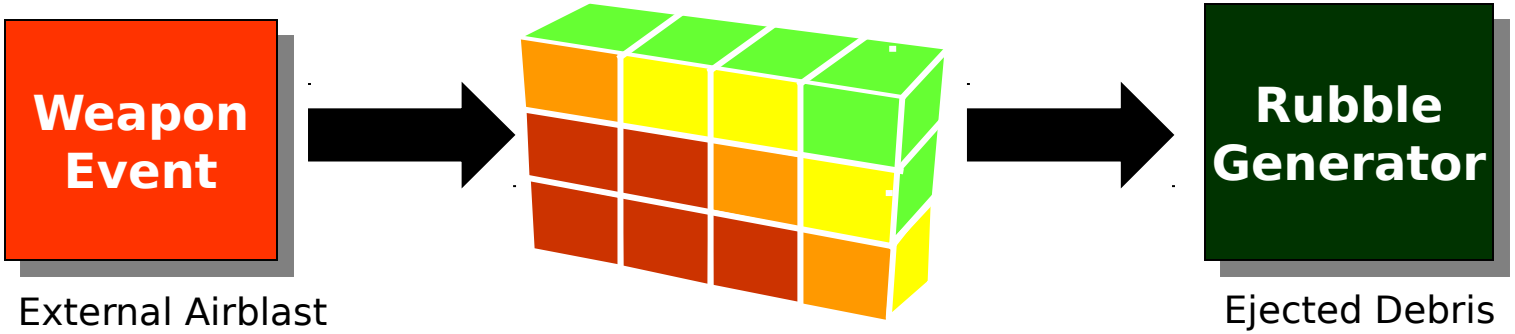
External Airblast
Internal Airblast

Ejected Debris
Gravity Debris

F2P FY03 Tasks - Structural Weapons Effects

Task 3: Baseline development of algorithms to handle cumulative structural damage effects on debris field algorithms

- Initial algorithms to handle debris that is produced from an area in the building that had previous structural damage and debris
- Output: building objects having specific 3d damage to feed to rubble generation algorithms



External Airblast
Internal Airblast

COMBATXXI will need to store 3d damage for this Task

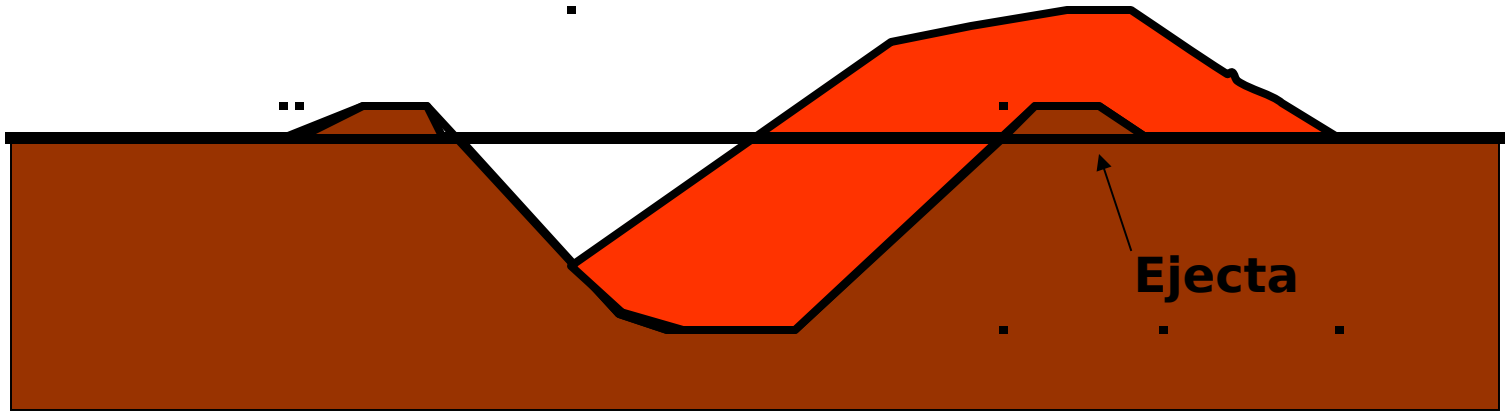
Ejected Debris
Gravity Debris

F2P FY03 Tasks - Structural Weapons Effects

Task 4: Develop algorithms for handling overlap of debris and crater fields

- Initial algorithms to handle what happens when debris falls into an existing crater. Will require COMBATXXI to call when needed.

- Output: modified crater objects and adjusted rubble object



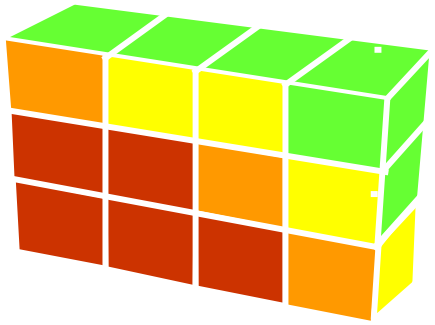
F2P FY03 Tasks - Structural Weapons Effects

Task 5: Incorporate new development into Structural Weapons Effects API

- Primary need is for COMBATXXI to support idealized 3d buildings consisting of rooms and wall, floor and roof components

- In order to take advantage of 3d damage to structures, the damage must be stored in the COMBATXXI building objects so that cumulative damage can occur.

- Idealized structures consist of buildings explicitly divided into floors and bays internally. Typical dimensions will be used that are a function of building type.



Rubble Parameters

Rubble()

Rubble, in reality, is a function of many things, not all of which are modeled explicitly in M&S

- Wall type (load bearing, mass construction, cladding, etc.)
- Wall details (one-way, two-way, windows, openings, flexural/shear strength, mass, span, thickness, layered, etc.)
- Material type (stone, masonry, brick, concrete, steel panel, wood framing, etc.)
- Loading (impact, pressure, impulse, waveform (rise/decay time), direction, venting, edge effects)
- Wall response (penetration, crushing, spalling, flexural failure, shear failure, impact with ground, trajectory, etc.)
- Wall location (x, y, z, interior, exterior)
- Overall structural response (collapse)
- Existing damage to structure (effects how much additional rubble can be generated by a particular event)
- Existing rubble on the ground (2 + 2 does not necessarily = 4)
- Existing craters (2 - 2 does not necessarily = 0)

All of these parameters effect in some degree the location, size, and attributes of a pile of rubble on the ground

F2P FY03 Tasks - Structural Weapons Effects

- Soon to complete FY02 algorithms for static damage - predicting realistic rubble objects given simply an overall damage.

- Just received FY03 funding last week

- Must work with COMBATXXI to incorporate FY02 Tasks and to determine how to support SWE API idealized 3d building needs for FY03 Tasks.